

Surgical Exploration of the Abdominal Lymphatic System in Patients with Malignancies

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Summary

In the management of selected patient with malignant diseases, laparotomy can be useful for determining the anatomic extent of disease in order to individualize appropriate intensive treatment. The decision to subject a patient to a staging laparotomy requires joint decisions by surgeons, radiation therapists, chemotherapists, and diagnostic radiologists, after a thorough preoperative abdominal evaluation has been made. The lymphangiogram is especially important for directing the surgeon to a single node of concern. Special efforts must be made to insure that the specific node in question is biopsied.

The justification of such a surgical procedure assumes that definitive decisions in management of such patients will result in an improved prognosis. While this appears to be the case with Hodgkin's disease and lymphomas, studies are underway to prove this assumption in other neoplasms. For most patients, staging laparotomy presently represents an investigational procedure of value only in selected patients. The critical problem is how these patients can be identified.

Determining the extent of disease in a patient who has a diagnosis of malignancy is important to the clinician for several reasons. First, for a given histopathologic diagnosis, the extent of disease is the most important single variable in predicting the prognosis for an individual patient. Second, it permits meaningful comparisons between different series, different institutions, and different treatments. Third, it serves as a useful guideline for decisions concerning appropriate therapy. With increasing effectiveness of both radiation therapy and chemotherapy in the treatment of malignant diseases, there has been a progressive willingness to subject a patient to additional procedures for accurate staging. The value of an invasive procedure such as a laparotomy can be justified when the findings are expected to determine definitive decisions concerning potentially curative treatment for an individual patient.

The purpose of this communication is to review the indications and usefulness of staging laparotomies in patients with malignant diseases.

General Considerations

Patients with malignant disease may undergo a laparotomy under different circumstances. Often a patient presents with abdominal symptoms and undergoes an exploratory laparotomy *for diagnosis*. A second setting for laparotomy occurs when a patient has a recent biopsy revealing malignant disease and undergoes a radical surgical procedure *for definitive treatment*. By contrast, a staging laparotomy refers to a very specific setting in which a patient has a known diagnosis of malignant disease and undergoes exploration specifically *for determination of the extent of disease* within the abdominal cavity. In such a patient, the findings at laparotomy are expected to influence postoperative decisions concerning additional treatment for the patient, either radiation therapy or chemotherapy or a combination of both. It is of inestimable value to the radiotherapist to have the precise location of abdominal tumor marked by metallic clips so that the tumor volume can be identified in the treatment position.

In modern cancer treatment, definitive decisions concerning treatment for an individual patient usually reflect the joint opinions of surgeons, radiation therapists, chemotherapists, and diagnostic radiologists. It is essential to stress the necessity of *all* physicians involved in the care of a patient to participate preoperatively in the decision to subject a patient to a staging laparotomy.

Since a staging laparotomy is essentially an elective procedure above and beyond the usual laboratory, scintigraphic, ultrasonographic, and radiographic procedures, there are several specific

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considerations involved in determining whether a patient should undergo such a procedure. First, the patient must be a candidate for potentially curative treatment regimens which would justify such a procedure. The patient should not have evidence of hematogenous or disseminated neoplasm. If a patient is so fragile or so compromised by other medical illnesses or age that aggressive treatment alternatives are out of the question, staging laparotomy obviously should not be employed. Second, the patient must be well enough to undergo a major elective surgical procedure. Third, the findings at surgery must be expected to influence the final decision upon potentially curative treatment, either in terms of modality to be used or tumor volume to be encompassed in a radiation portal. If the physicians involved with a specific patient know what treatment should be administered because of the staging information derived from other studies, a staging laparotomy is not indicated.

Because the procedure is both elective and investigational at present, the staging laparotomy should not subject the patient to an excessive risk. Not only does this risk refer to direct complications from the surgery, but it also refers to the increased risk seen in patients who undergo postoperative treatment of an aggressive type. A transperitoneal incision may be associated with increased risk of bowel complications resulting from high dose radiation therapy when large volumes are treated with curative intent; in some patients with pelvic neoplasms, an extraperitoneal technique may be preferable to approach the para-aortic nodes.

It is extremely important that all physicians recognize what precise information is desired from the surgery. If the critical question concerns involvement of the liver, a liver biopsy *must* be obtained regardless of a grossly normal appearance, both by palpation and inspection. If the critical question concerns the spleen in a patient who has lymphoma or Hodgkin's disease, the only reliable way of determining splenic involvement is to remove the spleen and examine it microscopically. It cannot be overemphasized that the surgeon must know what exact information

is needed by his colleagues for decisions concerning the details of radiation therapy or chemotherapy.

Rather than a radical lymphadenectomy which might be performed for therapeutic purposes in a patient with a pelvic carcinoma, a staging laparotomy usually consists of *selected* lymph node biopsies, liver biopsies, and biopsy of other specific organs that are suspicious either preoperatively or at the time of surgery. (In lymphoma patients, splenectomy and open bone marrow biopsies are also routinely performed.) The staging laparotomy for malignant disease should be directed at those specific lymph nodes thought to be abnormal by lymphangiogram. Following consultation with his colleagues, the surgeon must make every effort to obtain the precise node in question. Clips must be placed to mark the site of biopsies; often a diagnostic radiograph must be obtained intraoperatively to verify that the specific node was biopsied. Without such efforts, the usefulness of the laparotomy may be drastically reduced.

Staging Laparotomy Versus Peritoneoscopy and Lymphangiography

In recent years, peritoneoscopy has proved specially useful for determination of diaphragmatic peritoneal implants from carcinoma of the ovary (1) and intrahepatic disease secondary to Hodgkin's disease or malignant lymphomas (2). However, as a detailed staging procedure, peritoneoscopy has certain limitations. It is difficult to obtain definitive information about the spleen by means of peritoneoscopy in patients with lymphoma, although some reports suggest that this may be possible (3). Retroperitoneal or mesenteric lymph node involvement cannot easily be determined by means of the peritoneoscope. In some patients (especially those with adhesions resulting from prior surgical procedures), the poorer exposure obtained during laparoscopy (as compared to what can be achieved at laparotomy) may compromise optimal biopsy procedures. Thus, the decision as to whether or not peritoneoscopy should be used in lieu of a staging laparotomy will depend upon the information desired (e.g. definitive information about the liver or diaphragm as opposed to

the spleen or nodes) and the experience of individual surgeons in utilizing the procedure. Often the question arises as to the need for a lymphangiogram if a staging laparotomy is performed. The inevitable discrepancy that must exist between skillful lymphangiographic interpretation and histologic confirmation will reflect a) focal microscopic involvement that can *only* be determined by pathologic examination and b) the frequency with which the nodes of concern to the radiologist are inadequately sampled by the surgeon. Despite these problems, the lymphangiogram serves to alert the surgeon to one particularly suspicious node that would be otherwise difficult to identify without the assistance of the lymphangiogram. In addition, the opacification of the nodes allows the radiation therapist to identify the precise location of the nodes in the treatment position. Finally, the lymphangiogram is invaluable for following the patient's response to treatment and for detecting disease activity by means of abdominal and pelvic radiographs.

Lymphomas and Hodgkin's Disease

Because of the complexity of various treatment regimens, the use of the staging laparotomy as an aid to therapeutic decision-making grew primarily in the area of treatment for Hodgkin's disease (4, 5). Performing a splenectomy as part of the staging procedure had the added benefit of reducing the risk of radiation pneumonitis and nephritis that might result from splenic irradiation. Moreover, it usually resulted in higher platelet and leukocyte counts, especially important if both high dose irradiation and intensive combination chemotherapy were to be used (6).

Studies resulting from staging laparotomies in Hodgkin's disease have greatly added to our understanding of the natural history of this disease. Only about 10% of patients who have a negative lymphangiogram will have positive para-aortic nodes. The most common site of occult subdiaphragmatic involvement in patients with Hodgkin's disease is the spleen. Approximately 25% to 30% of patients who have no overt clinical evidence of subdiaphragmatic involvement of Hodgkin's

disease prove to have occult splenic involvement, often without other detectable sites of tumor. Hepatic involvement with Hodgkin's disease is virtually always seen in association with splenic involvement, the converse is not true.

Splenic involvement appears to be an important means of selecting those patients who are at high risk for hepatic involvement and who, therefore, require more aggressive treatment, especially when systemic symptoms are present (7). In addition, staging laparotomy in childhood is useful for selecting those patients in whom the radiation portal can be restricted (8) to minimize growth arrest resulting from irradiation.

The use of staging laparotomy in patients with non-Hodgkin's lymphomas remains highly controversial, primarily because of the more advanced stage of disease with which these patients often present, the older age of these patients, and often their more debilitated state. It is in patients with non-Hodgkin's lymphomas that peritoneoscopy has proved exceedingly valuable for determination of hepatic involvement (2). Nonetheless, the use of the staging laparotomy as an investigative tool has proved useful in adding to our understanding of the natural history of this group of diseases (9). In contrast to patients with Hodgkin's disease, the patients with non-Hodgkin's lymphoma only to the spleen. In general, patients with an abnormal lymphangiogram who have nodular lymphoma (using the system of Rappaport) (10) can be expected to have splenic and often marrow involvement. Patients with diffuse lymphoma and a negative lymphangiogram have only about 10% likelihood of having occult subdiaphragmatic disease. However, the most important findings resulting from staging laparotomy in patients with non-Hodgkin's lymphoma is the recognition that the most likely sites of occult intra-abdominal involvement are mesenteric lymph nodes which cannot be well documented by any other means at the present time. Ultrasound and/or CAT scans may be employed clinically, but as yet no prospective study has determined delete that accuracy for detection of mesenteric lymph node involvement. Such involvement has major therapeutic implications for the radiation

Table 1 Para-aortic Node Involvement Documented by Staging Laparotomy in Patients with "Localized" Pelvic Carcinomas at Presentation.

Author Reference	Tumor	No. Patients with Para-aortic Biopsies	No. with Positive Para-aortic Nodes	Percent
<i>Buchsbaum</i> (12)	Carcinoma of the Cervix	4	0	0
	Stage I	4	0	0
	Stage II	11	1	9
	Stage III	20	8	40
	Stage IV	2	1	50
	Total	37	10	27
<i>Averette et al.</i> (13)	Carcinoma of the Cervix			
	Stage I	40	3	7.5
	Stage II	18	4	22
	Stage III	10	2	20
	Stage IV	2	1	50
	Total	70	10	14.3
<i>Knapp and Friedman</i> (15)	Ovarian Cancer			
	Stage I	26	5	19.2
<i>Spellman et al.</i> (24)	Prostate Cancer			
	Limited to Prostate	35	2	5.7
	Extracapsular Extension	33	10	30.2
	Total	68	12	16.2
<i>Ueling</i> (27)	Penile Carcinoma	4	1	25

therapist; if mesenteric lymph nodes are known to be involved, radiation treatment must be aimed at the entire abdomen (11) rather than at the axial nodes alone.

Pelvic Neoplasms

In recent years, staging laparotomies have been performed in a variety of patients with pelvic neoplasms. The intention in these patients is to treat the primary tumor and regional pelvic lymph nodes. The purpose of the staging laparotomy has been investigational to determine if there is more extensive disease *outside the pelvis* which will require additional treatment, either radiation or intensive chemotherapy. Individual series are difficult to analyze in terms of the selection factor of patients who were explored. Nonetheless, most series show that apparently "localized" carcinomas often have regional pelvic lymph nodes involved and many will also have unsuspected para-aortic node involvement (see Table 1).

At the time of presentation, a significant proportion of patients with carcinoma of the cervix, can be seen to have disease outside the

pelvis in para-aortic lymph nodes (12, 13). The detection of such extrapelvic disease has major therapeutic implications; treatment will be directed at the para-aortic nodes in such patients. Studies are presently underway to determine if such treatment will, in fact, alter the prognosis for these patients (14).

Knapp and Friedman reported a series of 26 patients with stage I carcinoma of the ovary, five of whom had para-aortic node involvement at the time of staging laparotomy (15). Peritoneoscopy has also been recently described to be of great value in determining diaphragmatic involvement from pelvic ovarian carcinoma (1), but not retroperitoneal node disease. The relative importance of peritoneal disease as opposed to para-aortic node involvement remains unclear. How often it either appears alone or in combination with other processes is an area of investigation. There is some suggestion that radiotherapy to the para-aortic nodes in patients with carcinoma of the ovary may be of value in improving the prognosis (16). Peritoneoscopy and even second-look laparotomies also have an important role to play in the select group of patients with pelvic

Table 2 Documented Celiac Node Involvement at Presentation of Patients with Apparently Localized Carcinoma of the Esophagus*

Location of Primary	No. of Patients	No. Involved	Percent
Upper Third	6	0	0~
Middle Third	20	9	45
Lower Third	11	6	55
Total	37	15	40.5

*From Doggett et al. (26) 1970

neoplasms who appear clinically to have successfully completed their planned treatment (17, 18, 19)

Prostate cancer represents another pelvic neoplasm in which para-aortic node involvement has become recently recognized. In patients with prostatic carcinoma, the factors of selection involved in staging laparotomies are more extreme. Obviously, age and coincidental medical problems present significant factors that influence the decision to perform a staging laparotomy. The comparatively indolent natural history of patients with prostatic carcinoma makes staging laparotomy more difficult to justify in this group. Nonetheless, prostate cancer is clearly associated with involvement of regional pelvic lymph nodes in a significant proportion of patients (20, 21, 22, 23). Moreover, para-aortic lymph node involvement is detected in approximately 15% of patients who have disease confined to the pelvis clinically; if the local disease in the prostate extends into the seminal vesicles, the proportion of para-aortic node involvement is even higher (24).

Thoracic Neoplasms

The relatively poor prognosis for patients with lung cancer or esophageal carcinoma remains a major therapeutic challenge. Radical surgery has a small but definite cure rate associated with procedures of considerable morbidity. Because of the great frequency of distant metastases associated with these neoplasms, especially carcinoma of the lung, staging laparotomy has occasionally been utilized to determine that subdiaphragmatic disease was not present before subjecting a patient to

radical intrathoracic surgery. Approximately 20% of patients with clinically "localized" intrathoracic carcinoma of the lung will have unsuspected disease in the upper abdomen (usually in the liver or celiac nodes) at presentation (25). For patients with carcinoma of the esophagus which is apparently confined to the mediastinum, approximately 40% will have occult subdiaphragmatic disease, primarily in the celiac nodes (26). The probability of celiac node involvement increases as lesions are located lower along the esophagus (see Table 2).

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